YUASA NP SERIES MAINTENANCE-FREE RECHARGEABLE BATTERIES FOR UPS (Uninterruptible Power Supply) APPLICATIONS

BATTERY YUASA TRADE MARK

YUASA BATTERY CO., LTD.

INTRODUCTION

Construction

Yuasa NP Series batteries are maintenance free sealed lead acid batteries employing a lead calcium alloy grid system.

Service Life

During the expected 5-year float service life of these batteries, there is no need to check the specific gravity of the electrolyte, or add water. In fact, there is no provision for these maintenance functions.

Performance

The combination of extremely high energy density (WH/cubic inch), specific energy (WH/pound), charging efficiency, long shelf life (up to 1 year), and rigid quality control insure preformance reliability and service life for NP batteries in UPS systems which is unmatched by other sealed lead acid batteries.

Low Pressure Venting

Yuasa NP batteries are equipped with low pressure vents. The excess gas vented periodically during charging is a dry, nonvolatile, noncorrosive gas consisting of 99% oxygen, 0.01% hydrogen, and .99% impurities. The low pressure venting system and the extraordinarily high recombination efficiency combine to make NP batteries the safest battery system on the market for use in "In Room" uninterrupible power supplies.

Reduced Cost

The absence of costly maintenance requirements make Yuasa NP batteries much less expensive than conventional stationary wet batteries when prorated over the life of a UPS system.

TECHNICAL FEATURES

Sealed Construction

Yuasa's unique construction and sealing technique guarantee that no electrolyte leakage can occur from the terminals or the case of any NP battery.

Electrolyte Suspension System

All Yuasa NP batteries utilize an electrolyte suspension systems consisting of a glass fiber base separator material. This suspension system allows maximum life and service. No silica gels or other contaminants are used.

Gas Generation

Yuasa NP batteries incorporate a unique Yuasa design that effectively controls generation of gas and allows gas recombination within the battery of over 99% of the gas generated in normal usage.

Venting System

Yuasa NP batteries are provided with a safe low pressure venting system designed to release excess gas and reseal automatically in the event that gas pressure rises to a level above the normal rate. Thus, there is no excessive buildup of gas in the batteries.

Heavy Duty Grids

The heavy duty calcium-alloy grids in NP batteries provide an extra margin of performance and service life even in conditions of extremely deep discharge.

Low Self Discharge

The self discharge rate of NP batteries is approximately 3% per month when the batteries are stored in temperature conditions of 15°C to 25°C (59°F to 77°F). Under these conditions NP batteries may be stored for up to 1 year without any appreciable deterioration.

Operating Temperature Range

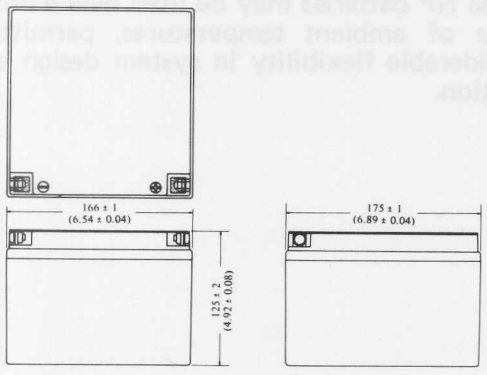
Yuasa NP batteries may be used over a broad range of ambient temperatures, permitting considerable flexibility in system design and location.

Table 1 YUASA UPS BATTERIES – SPECIFICATIONS

		NP24-12	NP38-12	NP65-12
	NOMINAL VOLTAGE	12 V	12 V	12V
	NOMINAL CAPACITY (20Hr. Rate)	24 AH	38 AH	65AH
	WEIGHT (APPROX.)	19 lbs/8630 gr	30 lbs/13800 gr	50 lbs/22700 gr
	ENERGY DENSITY (20HR. Rate)	1.30WH/Cubic inch	1.35WH/Cubic inch	1.26WH/Cubic inch
	INTERNAL RESISTANCE	35 Milliohms	10 Milliohms	5 Milliohms
	MAXIMUM DISCHARGE CURRENT	150 Amperes	200 Amperes	500 Amperes
	MAXIMUM SHORT DURATION DISCHARGE CURRENT	500 Amperes	500 Amperes	800 Amperes
OPERATING TEMPERATURE RANGE	CHARGE	5°F to 122°F (–15°C to 50°C)	5°F to 122°F (–15°C to 50°C)	5°F to 122°F (–15°C to 50°C)
	DISCHARGE	–4°F to 140°F (–20°C to 60°C)	–4°F to 140°F (–20°C to 60°C)	–4°F to 140°F (–20°C to 60°C)
	STORAGE	–40°F to 140°F (–40°C to 60°C)	–40°F to 140°F (–40°C to 60°C)	–40°F to 140°F (–40°C to 60°C)
	LIFE EXPECTANCY	3 to 5 years	3 to 5 years	3 to 5 years
	STANDARD TERMINAL	Bolt Terminal & Faston Tab 250	Bolt Terminal	Bolt Terminal

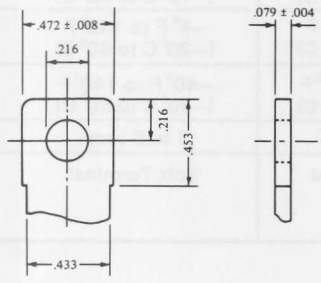
NP24-12B, BOLT TERMINAL

• DIMENSIONS



DIMENSIONS: MM (INCHES)

• TERMINAL

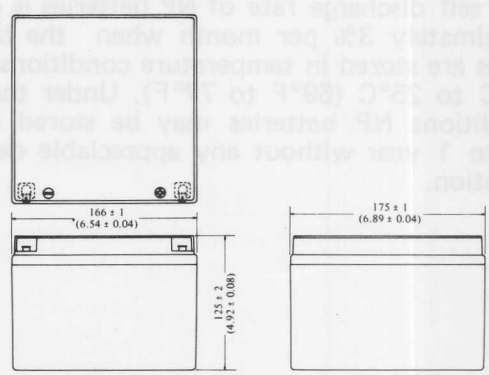


INCH	=	MM
.472		12.00
.453		11.50
.433		11.00
.216		5.50
.079		2.00

DIMENSIONS: INCHES

NP24-12, FASTON TAB

• DIMENSIONS



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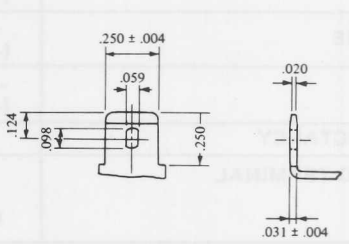
• TERMINAL

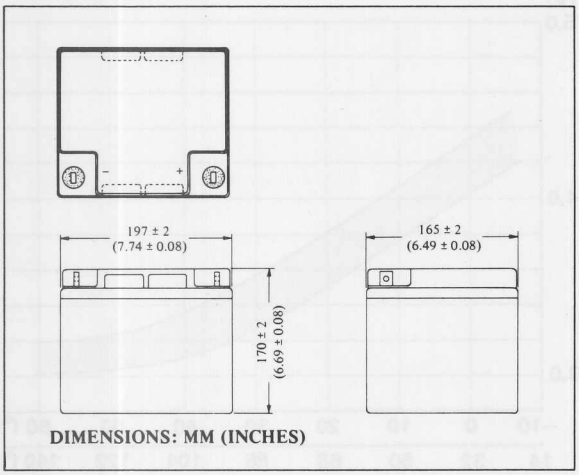


INCH	=	MM
.250		6.35
.124		3.15
.098		2.50
.059		1.50
.031		0.79
.020		0.51

DIMENSIONS: INCHES

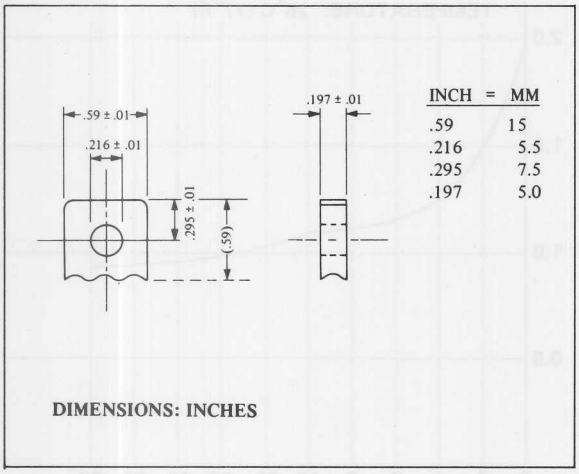
NP38-12, BOLT TERMINAL

• DIMENSIONS



DIMENSIONS: MM (INCHES)

• TERMINAL

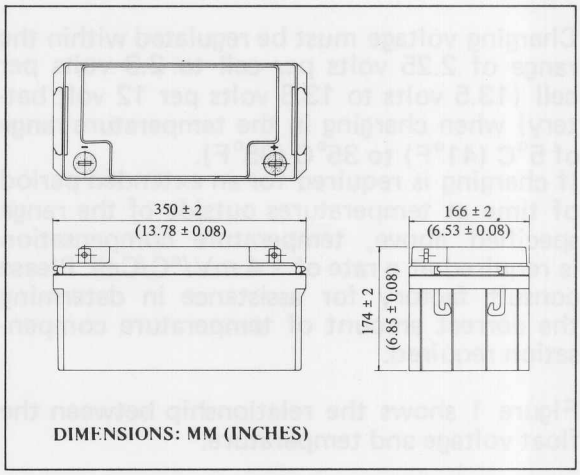


INCH	=	MM
.59		15
.216		5.5
.295		7.5
.197		5.0

DIMENSIONS: INCHES

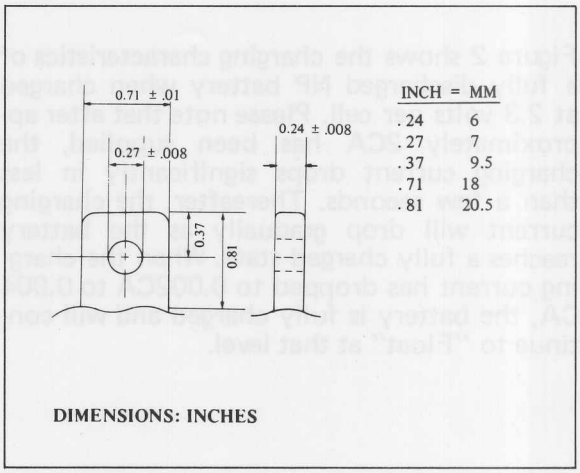
NP65-12, BOLT TERMINAL

• DIMENSIONS



DIMENSIONS: MM (INCHES)

• TERMINAL



INCH	=	MM
.24		6
.27		7
.37		9.5
.71		18
.81		20.5

DIMENSIONS: INCHES

GENERAL

Charging Requirements

Charging voltage must be regulated within the range of 2.25 volts per cell to 2.3 volts per cell (13.5 volts to 13.8 volts per 12 volt battery) when charging in the temperature range of 5°C (41°F) to 35°C (95°F).
If charging is required for an extended period of time at temperatures outside of the range specified above, temperature compensation is required at a rate of ± 4 mV/°C/Cell. Please consult factory for assistance in determing the correct amount of temperature compensation required.

Figure 1 shows the relationship between the float voltage and temperature.

If an equalizing charge is required, the equalizing charging voltage must be regulated within the range of 2.4 volts per cell to 2.45 volts per cell, or 14.4 volts to 14.7 volts for each 12 volt battery.

Figure 2 shows the charging characteristics of a fully discharged NP battery when charged at 2.3 volts per cell. Please note that after approximately 2CA has been supplied, the charging current drops significantly in less than a few seconds. Thereafter, the charging current will drop gradually as the battery reaches a fully charged state. When the charging current has dropped to 0.002CA to 0.004 CA, the battery is fully charged and will continue to "Float" at that level.

Fig. 1 FLOAT VOLTAGE vs. TEMPERATURE

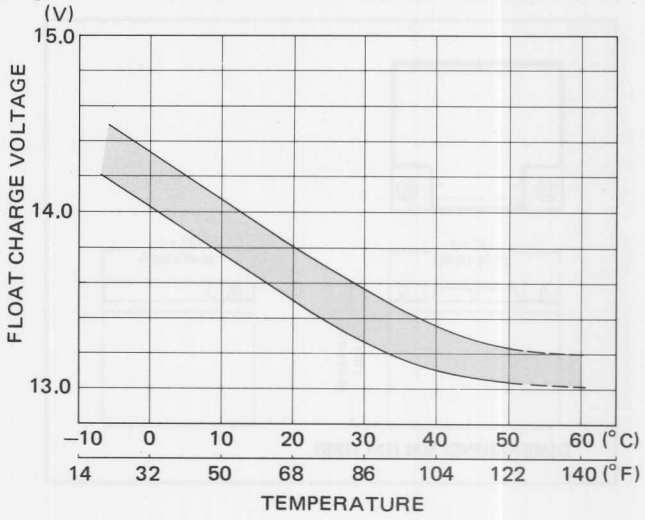
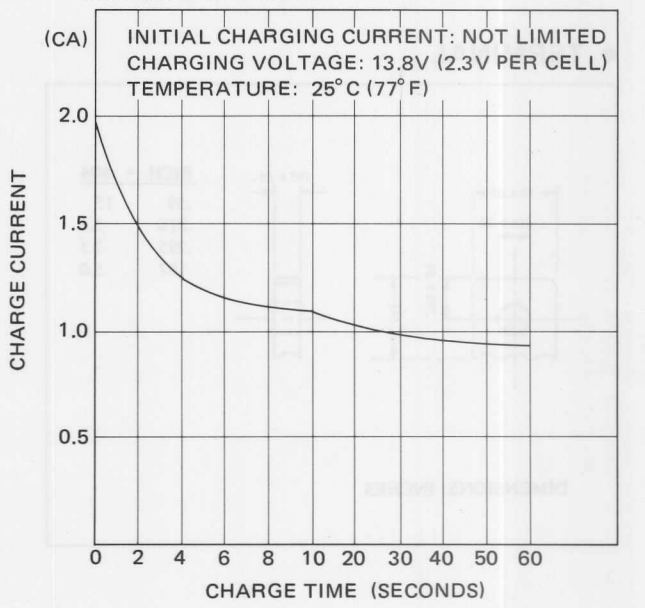


Fig. 2 CHARGING CHARACTERISTICS OF A 12V NP BATTERY
BY FLOAT CHARGING



APPLICATION

I. Battery Discharge Characteristics At Constant Load (WATTS)

Figures 3, 4, and 5 show the relationship between watts and continuous discharge time to final voltages of 10.8 volts, 10.2 volts, and 9.6 volts per 12 volt battery. (1.8 volts/cell, 1.7 volts/cell, and 1.6 volts/cell.)

Using Figures 3, 4, and 5 output or discharge current of a battery group can be calculated.

1. Discharge time is read on the horizontal scale. Watts per battery is read on the vertical scale. The final voltage curves are displayed graphically.
2. Select the desired discharge time and final voltage. The point where the discharge time and the final voltage curve lines intersect indicates the output watts of the battery.

Fig. 3 DISCHARGE CHARACTERISTICS OF NP 24-12 (B) AT CONSTANT LOAD (WATTS)

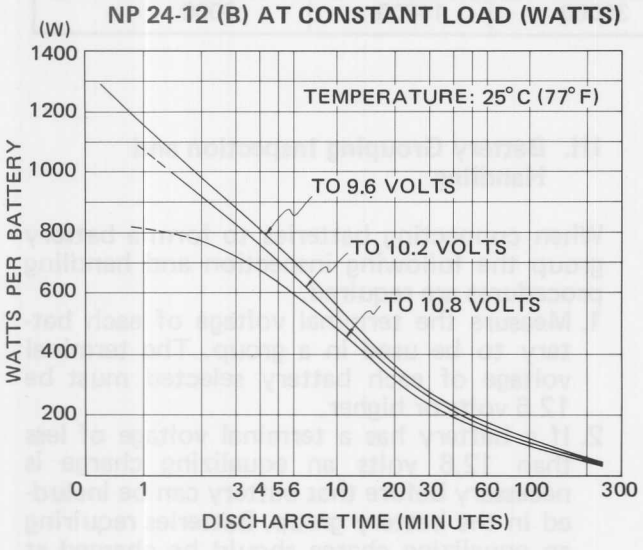


Fig. 4 DISCHARGE CHARACTERISTICS OF NP38-12 AT CONSTANT LOAD (WATTS)

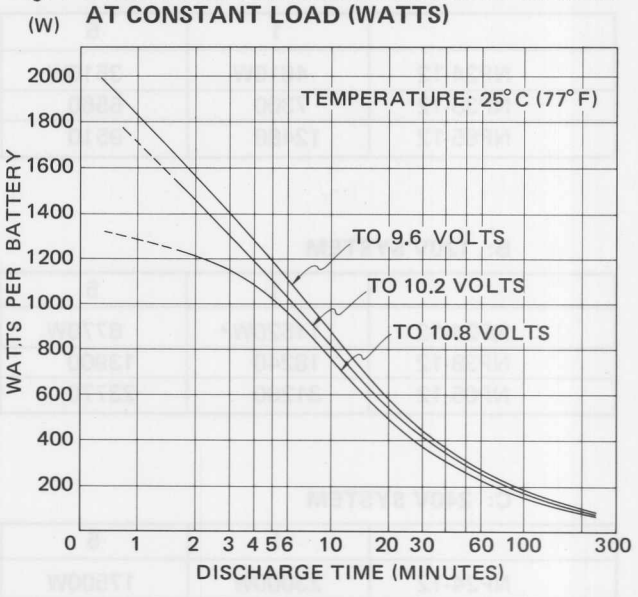


Fig. 5 DISCHARGE CHARACTERISTICS OF NP65-12 AT CONSTANT LOAD (WATTS)

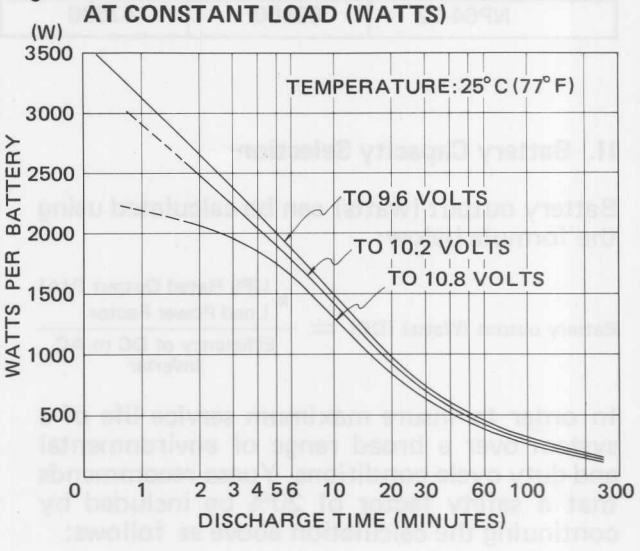


Table 2 shows watts per battery at 48, 120 and 240 volts systems.

Teble 2 Watts per Yuasa UPS Batteries.

Cut-off voltage: 9.6V/BATTERY
Temperature: 77°F (25°C)

A: 48V SYSTEM

	1	5	10	30	60 Minutes
NP24-12	4610W	3510W	2210W	1090W	660W
NP38-12	7300	5560	3510	1730	1050
NP65-12	12480	9510	6000	2960	1800

B: 120V SYSTEM

	1	5	10	30	60 Minutes
NP24-12	11520W	8770W	5520W	2720W	1650W
NP38-12	18240	13900	8770	4320	2650
NP65-12	31200	23770	15000	7400	4500

C: 240V SYSTEM

	1	5	10	30	60 Minutes
NP24-12	23000W	17500W	11000W	5450W	3300W
NP38-12	36400	27800	17500	8650	5300
NP64-12	62400	47500	30000	14800	9000

II. Battery Capacity Selection

Battery output (watts) can be calculated using the formula below:

$$\text{Battery output (Watts) (DC)} = \frac{\text{UPS Rated Output (VA)} \times \text{Load Power Factor}}{\text{Efficiency of DC to AC Inverter}}$$

In order to insure maximum service life of a system over a broad range of environmental and duty cycle conditions, Yuasa recommends that a safety factor of 20% be included by continuing the calculation above as follows:

$$\frac{\text{Calculated Battery Output (Watts) (DC)}}{0.8} = \text{Optimum Battery Output Watts}$$

Please note that the DC Load Requirement must be specified by the inverter manufacturer or system user to enable proper design of a UPS system.

III. Battery Grouping Inspection and Handling

When connecting batteries to form a battery group the following inspection and handling procedures are required.

1. Measure the terminal voltage of each battery to be used in a group. The terminal voltage of each battery selected must be 12.6 volts or higher.
2. If a battery has a terminal voltage of less than 12.6 volts an equalizing charge is necessary before that battery can be included in the battery group. Batteries requiring an equalizing charge should be charged at 14.4 volts to 14.7 volts for 10 to 20 hours.
3. If any battery is found to have a terminal voltage of less than 12.3 volts, no attempt should be made to use it in a battery group until separate discharge and charge acceptance tests have been conducted. Please contact factory for specific recommendations.

IV. Cabling Recommendations

1. It is essential to use uniform connectors and/or cable of sufficient gauge to carry the specified DC load.
2. A Voltage-Equalizing Cable, or Ladder Connection is required for parallel connection of 2 or more 48 volt battery groups. Refer to Figure 6.
3. When assembling battery groups it must be remembered that operational performance of a battery group will be determined by several factors including differences that may exist in electrical potentials between the batteries. Therefore, the configuration of a battery group is very important. Figure 7 illustrates recommended configurations.
4. If 2 or more battery groups are used in parallel connection, they must be connected to the load through equal lengths of cable and each cable must be equipped with a fuse.
5. When assembling a battery group, free air space must be provided between each of the batteries in the group. The minimum recommended spacing between batteries is 0.04 inches (10 mm) to 0.6 inches (15 mm).
6. When assembling 240 volt battery groups, maximum performance will be obtained by limiting parallel connections to 3 lines or less.

Fig. 6: SERIES-PARALLEL CONNECTION

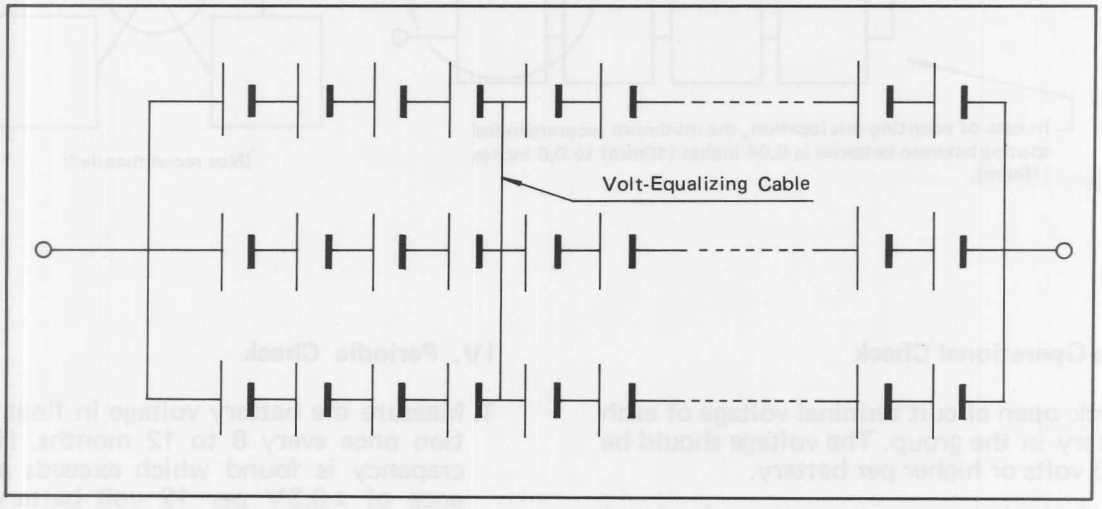
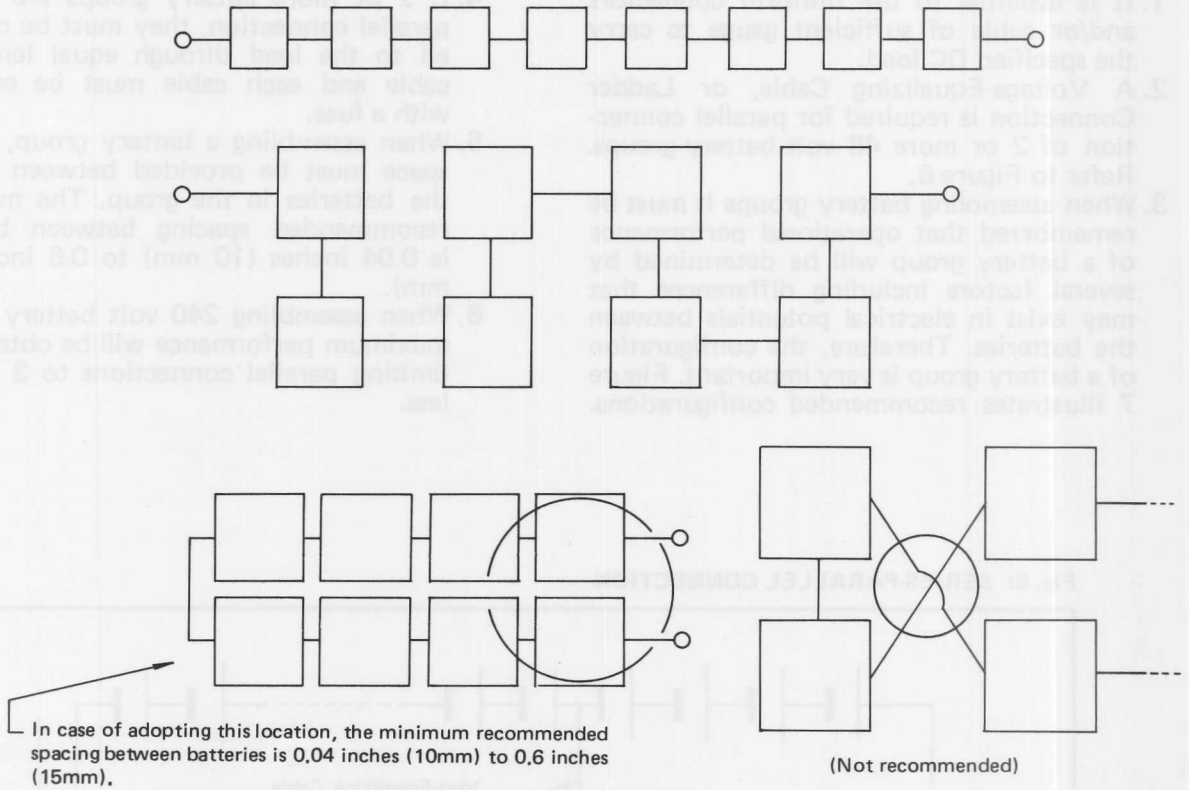


Fig. 7: LOCATION OF BATTERIES



V. Pre-Operational Check

1. Check open circuit terminal voltage of each battery in the group. The voltage should be 12.6 volts or higher per battery.
2. Check the battery system voltage in closed circuit. If the proper total system voltage is met, the system is ready for service.

IV. Periodic Check

1. Measure the battery voltage in float operation once every 6 to 12 months. If a discrepancy is found which exceeds a tolerance of ±0.3V per 12 volt battery, it is recommended that an equalizing charge of 14.4 volts to 14.7 volts per 12 volt battery be applied for 10 to 20 hours.
2. Beginning at the anniversary of the 3rd year after the date the system was put in service, it is recommended that a load test be performed every 6 months to confirm the capacity of the battery system.